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MARKS OF READABLE STYLE

A Study in Adult Education

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By
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Teachers College, Columbia University
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To the Memory of My Father

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PREFATORY NOTE

THANKS are due: to Mr. Lyman Bryson, for ever-ready inspiration, encouragement, and help; to Dr. Irving Lorge, for invaluable scientific advice and criticism, as well as for his permission to use certain unpublished statistical data; and to the American Association for Adult Education, under whose auspices the first half of this investigation was carried out.

* * *

Some readers of this book may be more interested in the practical application of the readability formula than in its scientific derivation. I suggest that these readers turn first to the Appendices and Chapter V.

R. F.

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"At a more advanced level, we have such tools as the equation or formula, which enable man to learn in a few hours fundamental and pervasive features of the behavior of things which he could otherwise learn only imperfectly with great labor or not at all."

THORNDIKE, HUMAN LEARNING

Chapter I

THE PROBLEM

ADULT EDUCATION is, by definition, the education of people whose main business is not learning but living. Much of it is informal, unorganized, improvised; much of it goes on in odd places and at odd times. When we think of the education of children, the picture of classroom teaching comes to our mind; but when we think of adult education, the corresponding picture is that of a night student, a lamp and a book. Adult education, for many obvious reasons, is largely self-education with the aid of books. One of its perennial problems is to find the right books.

A minor problem, one might think. But the teacher of adults, the discussion group leader, the readers' adviser in a public library know better. They know that there are many books written for the few but few books written for the many. They know that the layman, confronted with the average "popular" presentation of a subject, will almost certainly become baffled and frustrated. Yet, there is very little they can offer him instead. Whatever the field of knowledge, be it economics, psychology, or chemistry, the number of useful expositions available in print is pitifully small. Reading books has been, traditionally, the poor man's way of "getting an education"; if he cannot read those books without getting an education first, he is caught in a vicious circle. Democracy, in this instance, means an abundance of readable books.

No wonder, then, that for many years the readability of books has been the concern of those interested in adult education. Ever since James Harvey Robinson raised his voice for the

Humanizing of Knowledge [60],* efforts have been made to make his vision real, to provide the public with short readable books on serious topics. In 1936 these endeavors came to a climax with the foundation of the Readability Laboratory of the American Association for Adult Education. This laboratory was charged with the task of assembling all that was known about readability, and of putting this knowledge to work by producing a series of experimental non-fiction books for mass consumption. The survey of research showed that the problem had been attacked previously from three different directions. The first was the sociology of reading: here the assembled body of facts gave conclusive evidence that a large majority of the American population—the readers of the confessional, detective, adventure, and of the women's and family magazines—almost never read any serious books and that virtually no material at that level was available in print. The second approach was the hygiene of reading: in this field substantial agreement was found among students as to what format, type-face, length of line gave optimum results. In the third area, reading difficulty, differences in style had been reduced by various investigators to statistical formulae which offered an easy means of gearing the language of educational writing to the capacities of different types of readers and of grading books for children. Those who worked in the Readability Laboratory at the production of what was later to become the *Peoples Library* series [50] had therefore reason to believe that they were right in the basic assumptions—that the "typical reader of the *Saturday Evening Post*" was in need of readable books, and that the size, type, and other features chosen would be to his liking; but when the statistical "readability formulae" were tested, the result was disappointing. It appeared that the formulae—most of which applied only to children's reading—gave no satisfactory answer to the particular problem of the Laboratory: to find the style characteristics that make popular magazines

* Numbers in brackets refer to references in Bibliography, pp. 49 to 54.

easier reading than the average non-fiction book, and to apply this knowledge to the production of readable books for adults. After many experiments in the Laboratory it was decided to attack the style problem of the *Peoples Library* volumes not by statistical formulae but by putting to work certain empirical rules for popular writing—rules by which the authors of the books were painstakingly trained for their task. Readability, for these working purposes, was qualitatively defined by the director of the Laboratory, Lyman Bryson [3], as "lucidity," "comprehensibility," and "appeal," three fairly self-explanatory terms indicating that a popular writer's three main duties are to think clearly, to write clearly, and to be interesting.

Despite the experiences with the mathematical readability formulae, however, the fact was undeniable that books differed in degrees of difficulty and that these differences were obviously related to certain differences in the language structure of the text. The available formulae were not quite satisfactory if applied to reading matter for adults; but that did not mean that a quantitative approach to the problem was impossible. On the contrary, it seemed likely that the existing formulae would furnish some clues for further research in the field of adult reading. This was the line of thought that started the writer on the present investigation while he was working in the Readability Laboratory.

Nineteen significant attempts to measure readability objectively have come to the writer's attention. These will be briefly described.

In 1923 Lively and Pressey [36] tried to estimate the difficulty of textbooks by assigning index numbers to the words used, in accordance with their placement in the Thorndike 10,000-words frequency list. (This list, later expanded to 20,000 words [71], shows the relative frequency of occurrence of each word within a wide variety of literature for children, including classics, textbooks, newspapers, magazines, corre-

spondence, and a wide assortment of reference and technical books.)

Keboch, 1927 [31], analyzing history textbooks, used a statistic based on the number of words listed in the second 5,000 of the Thorndike list.

Dolch, 1928 [15], estimated the "vocabulary burden" of school books by counting the number of different words within the text, and by computing the commonness of the vocabulary according to a combined word frequency list.

Vogel and Washburne, 1928 [80], offered a regression formula for children's reading based on the number of different words, the number of different uncommon words (outside the most frequent 1,500 in the Thorndike list), and the number of simple sentences. This formula—the so-called "Winnetka formula"—was tested against books that were read and rated by children. The average school grade of children who reported to have liked the books correlated to the extent of .845 with the formula.

Lewerenz, 1929 [34], found words beginning with w, h, or b indicative of ease, those beginning with i or e related to difficulty.

Johnson, 1930 [30], based his estimate on a count of polysyllables.

In 1931 Patty and Painter [49], testing textbooks, used the number of different words and a weighted index of Thorndike numbers.

Brown, 1931 [2], used the number of different words, the Thorndike rating, and the number of polysyllables.

Holland, 1933 [26], counted the number of simple sentences.

McClusky, 1933 [41], found significant differences in comprehension related to sentence length, frequency of technical terms, frequency of polysyllables, and especially to the number of common concrete nouns.

Dale and Tyler, 1934 [8], made experiments with colored people of limited reading ability. They arrived at a formula

correlating to the extent of .511 with comprehension test scores, using the number of certain previously marked technical words, the number of different hard non-technical words, and the number of indeterminate clauses. The second element was defined by means of a list [7] containing the 769 words which occurred both within the first 1,000 of the Thorndike list and the word list of the International Kindergarten Union, registering the vocabulary of preschool children.

Ojemann, 1934 [48], used the Dale and Thorndike lists for measuring vocabulary difficulty. He also found the number of prepositional phrases and the length of sentences significant, even if used without the vocabulary factor.

Lewerenz, 1935 [35], based his estimate on measures of vocabulary "diversity," vocabulary "difficulty," and vocabulary interest (number of colorful words).

In 1935 Gray and Leary published their book *What Makes a Book Readable* [25]. In this investigation all previous work in that field was carefully surveyed; then, on the basis of newly devised adult reading comprehension tests, a statistical analysis was made of those among eighty-two presumptive elements of difficulty which could be measured quantitatively. The final result of this new and fundamental investigation was a regression formula ($R = .6435$) based on the following five elements: number of different hard words (not included in the Dale list of 769 easy words); number of first, second, and third person pronouns; average sentence length in words; percentage of different words; and number of prepositional phrases.

DeLong, 1938 [11], counted the number of difficult words in primary reading material.

In 1938 Washburne and Mophett (Vogel) [82] revised their formula slightly, this time reporting a multiple correlation coefficient of .86.

Yoakam, 1939 [86], based his formula on an index figure derived from the Thorndike list.

Lorge, 1939 [38], tested the Gray-Leary formula against the

McCall-Crabbs *Standard Test Lessons in Reading* [40], a series of 376 passages for children which had been previously graded on the basis of ten comprehension test questions appended to each passage. Lorge, in this way, had the advantage of a far better criterion than any of his predecessors. He arrived at a multiple correlation coefficient of .7669 by using only three of the five elements used by Gray and Leary, namely, number of different hard words, number of prepositional phrases, and average sentence length in words. Lorge also tested the prediction value of weighted index figures given to the words in each successive thousand of the Thorndike list; however, this procedure yielded no appreciable advantage over the simpler three-elements formula. He also applied this test to:

The Morriss-Holversen method [43],* again without achieving additional prediction value. This method is based upon the following classification of words: Classification I, simplest word labels representing fundamental or elemental experiences in the life of a people in a given culture, such as "father," "water," "home," etc.; Classification II, words also learned early in life which differ from Classification I in being word-ideas which are localisms, such as "corn," "plow," "cattle," etc.; Classification III, words signifying concrete ideas, such as "filament," "Van Gogh," "Iraq," etc.; and Classification IV, words signifying abstractness, quality, states of mind, such as "platitudes," "torrid," "intellectuality," etc.

As has been mentioned above, many of these formulae were tried in the Readability Laboratory. Naturally, the majority of the experiments were done with the Gray-Leary formula, since it was based on exhaustive research and especially designed for adult reading matter. When Lorge offered his simplified modification, a large number of tests was carried out with this latest of all formulae although it was designed for the reading of children rather than adults. The results, however, remained

* The Morriss-Holversen technique, developed in the Readability Laboratory, has some affinity to the writer's subsequent experiments.

disappointing. Other investigations confirmed these experiences. Elliott [16], who tested and compared the Lively-Pressey, Patty-Painter, Yoakam, Washburne-Vogel, and Gray-Leary methods, found that the "five methods of measurement gave varying positions of difficulty to the material analyzed. Positions of individual books moved from the most difficult position in one method to the easiest in other methods." Wert [83] tested magazines with the Gray-Leary formula and found that *The Pathfinder* was estimated to be more difficult than *The Atlantic Monthly*. "Quite obviously this is contrary to actual fact." Jackman [28] sampled novels of different quality and "maturity" of content and found that, according to the Gray-Leary formula, books like *Tarzan of the Apes* and *The Insidious Dr. Fu Manchu* were difficult, and *Jean Christophe* and *Crime and Punishment* were very easy.

The two last mentioned experiments are particularly interesting since they repeat, in a sense, the situation in the Readability Laboratory: application of the Gray-Leary method to adult reading matter and failure of this formula to distinguish between mature English prose and what is known as "light reading."

This, then, was the starting point for the author's research: the Gray-Leary formula failed to indicate clearly differences in readability beyond a certain level of difficulty. This level seemed to be that of popular adult reading matter like the national weeklies of the *Saturday Evening Post* type. The same phenomenon appeared in the application of the Lorge formula—which uses three of the five elements used by Gray and Leary—and other formulae for children's reading, e.g., the widely used Vogel-Washburne "Winnetka" formula. (Walther [80a] tested popular magazines with the Winnetka formula and arrived at higher difficulty scores for *Newsweek, Time,* and *Reader's Digest* than for *Harper's Magazine* or *Atlantic Monthly*.) Both the Lorge and the Vogel-Washburne (Washburne–Mophett) formulae have been statistically proved to

be good indices of comprehension difficulty between the third and seventh reading grade levels. The main elements in both these formulae—although defined in different ways—are: (1) the number of certain less frequently used words, and (2) complexity, or length, of sentence structure. It is therefore clear that at least one among these two elements is a good index of comprehension difficulty for children, but fails to register differences in readability for adults. And it is clear, on the other hand, that one or more other factors must be found, or added, if a satisfactory formula for adult reading matter is to be constructed.

Chapter II

THEORY AND HYPOTHESES

THE FACTS related in Chapter I add up to the somewhat puzzling discovery that the differences in reading comprehension observed among children are not quite the same as those prevailing among adults. We must therefore at the start of this investigation ask ourselves: What is reading comprehension?

At the strictly operational level, the answer is: Reading comprehension is the capacity to answer correctly the questions in a reading comprehension test. "Readable," from this point of view, is a text that will evoke a large number of correct comprehension test responses, if read by a given group of readers. The concept of readability or of comprehension difficulty depends therefore upon the nature and composition of the reading comprehension tests used.

It is well known that reading comprehension tests differ in their emphasis upon different reading skills. Many investigators have pointed out that these different reading skills, such as securing facts, drawing inferences, or appreciating stylistic values, have only little relationship to each other. For instance, Tyler [78] tested students of zoology with an information test and a test of ability to infer from information gained by reading. The correlation found was .29. Dewey [13] got similar results: tests whether pupils were able to secure facts from the reading material, and tests whether they were able to do inferential thinking concerning the material read gave correlations of .382, .435, .650, and .652. Feder [18] reported on "comprehension maturity tests—a new technique in mental measurement." He devised graded tests for factual informa-

tion, for appreciation, and for inference. The correlations were: between facts and appreciation .30 and .31; between appreciation and inference .24 and .37; between facts and inference .29, .41, and .43.

Reading comprehension, then, is a composite of a number of different mental abilities. Recently, factor analysis has been used to distinguish the components. One investigation gives us as the most important factors: V (seeing verbal relationships, logic, ideas, meaning), P (perceiving details embedded in other material), and W (fluency in dealing with words, "readiness in producing words to fit a specified set, at least partially independent of the meanings of the words") in this order (Langsam [32]; see also Johnson [29], Thurstone [77]). Another, very thorough, investigation was carried out by Davis [9], who isolated the following nine components of reading comprehension:

> Component I is composed principally of memory for isolated word meanings.
>
> Component II . . . probably measures ability to manipulate concepts and ideas in relation to one another and may, perhaps, best be called abstract reasoning . . .
>
> Component III [appears to measure the ability] to understand the writer's explicit statements without recognizing their implications.
>
> Component IV measures chiefly the ability to infer the writer's intent, purpose, or point of view . . .
>
> Component V is composed principally of ability to select the appropriate meanings of words in the light of their particular contextual settings.
>
> Component VI seems to be a measure of ability to grasp the detailed statements in a passage.
>
> Component VII is almost entirely composed of the . . . ability to follow the organization of a passage and to identify antecedents and references in it.
>
> Component VIII measures principally specific knowledge concerning literary devices and techniques.
>
> Component IX is apparently pretty largely a measure of ability to synthesize the main ideas of a passage.

According to Davis, "it is probable that most reading tests (that are now commonly used in secondary schools and colleges) will be found to be largely measures of Component I."

This seems to be an extremely valuable clue to the answer to our problem. We have seen above that the Gray-Leary formula failed to establish differences in readability between *The Pathfinder* and *The Atlantic Monthly,* or between *Tarzan* and *Jean Christophe.* But the Gray-Leary formula is based on reading comprehension tests constructed in the accustomed fashion, whereas our evidence for the greater difficulty of *The Atlantic Monthly* or *Jean Christophe* is the judgment of experience and the knowledge of the average educational level among readers of magazines or books of this type. In other words, expert estimates of readability will tend to rank books or magazines for adults in a different order from that established on the basis of commonly used reading comprehension tests. They will tend to correct the overloading of those tests with Davis's Component I, "memory for isolated word meanings," and to stress rather the rest of Davis's components, II–IX. These factors deal, for instance, with ability to infer intent, purpose, or point of view (IV), ability to select word meanings in the light of their context (V), or ability to synthesize the main ideas (IX). If we realize how much of the reading done by adults today is of the lunch-hour and subway variety, we may well shift our attention toward such factors of reading comprehension.

However that may be, it seemed promising to the writer to proceed on the hypothesis that Davis's Component I, interpreted as "memory for isolated word meanings," is of relatively little importance in determining differences in reading comprehension among adults. The logical next step was, therefore, to investigate the language elements used in the various readability formulae and to establish their relationships with this particular factor of reading comprehension.

It became immediately obvious that the direct counterpart

to the factor in reading comprehension interpreted as "memory for isolated word meanings" was the readability factor consisting of an estimate of the vocabulary load by the ratio of uncommon words used in the text.

Among the nineteen readability formulae enumerated in Chapter I, fourteen are based entirely or in part on this factor, using a word frequency list to define objectively the element of "commonness." Eleven among these formulae are based directly or indirectly on Thorndike's *Teacher's Word Book.* Washburne and Vogel used it directly, drawing a line at the 1,500-words level; Gray-Leary and Lorge used it indirectly by way of the Dale list, which in turn is based on the International Kindergarten Union list and Thorndike's first thousand words. In view of these facts, Thorndike's *Teacher's Word Book* seemed a particularly pertinent first target for this investigation.

The basic principle of the "word-list" approach to the readability problem may be summarized as follows: Words that are demonstrably less frequent in general reading matter are, on the average, less familiar to readers; the higher the proportion of those words, the more obstacles to reading comprehension; hence, the more difficult the particular piece of reading matter.

In the years passed since the publication and general acceptance of the Thorndike list, many objections have been raised against this line of thought. These objections fall into five groups:

First, it has been pointed out that the list, because of the sources used, puts highly frequent words among the most infrequent ones and vice versa. Horn [27] illustrates his point by two telling examples. He gives a passage formed exclusively of words within the first 2,500 of the Thorndike list:

> The square of the sum of two numbers is equal to the square of the first added to twice the product of the first and second added to the square of the second.

In contrast, the following passage would be unintelligible by Thorndike standards:

Daddy helped me with my arithmetic until bedtime. I got a bracelet, a toy dresser and some gum for Christmas. Brother got a baseball and a sled.

It is easy to emphasize this deficiency of the *Teacher's Word Book* by enumerating some of the words outside the 20,000 "most common":

Applesauce, billboard, bootblack, bow-wow, buzzer, cock-a-doodle-doo, customer, diner, drugstore, duckling, earrings, firecracker, freighter, handbag, haircut, hatpin, homework, icebox, jackknife, lollypop, mailbox, marigold, pants, popcorn, raincoat, rayon, schoolbag, spaghetti, sublet, sundae, timetable, touchdown, varsity, zipper.

However, this argument can possibly be met by bigger and better list-making; Buckingham and Dolch [4] have published the *Combined Word List,* based in part on their Free Association Study; Rinsland and Moore [59] have listed the writing vocabulary of elementary school children; other improvements have been attempted.

A second argument assigns the shortcomings of the *Teacher's Word Book* to the fact that words with many different meanings are listed as one word if the spelling is the same. Lorge's and Thorndike's *English Semantic Count* [37] is an attempt to overcome this handicap. Yet, semanticists—like I. A. Richards—tell us with some justification that "words shift their meanings under the pressure of their contexts" [57] and "what a word means depends upon the purpose in hand" [56]. A semantic word count, therefore, will by its very nature always lag behind the continuous growth of the language.

A third argument deals with the fact that "the law of diminishing returns sets in sharply even after the 2,000 most commonly used words have been determined. After 4,000 words have been listed that law operates exceedingly sharply" (Na-

tional Conference on Research in English [45]). Similarly, Strang [67] found that 75–80 per cent of the vocabulary used in various fiction and non-fiction books was taken from the first thousand in the Thorndike list. She reported: "No consistent pattern of word difficulty in the proportion of words in the upper thousands of the Thorndike list was observed." Rickert [58] tested the occurrence of the 213 most common structural words in various pieces of literature and found that in general they constituted over fifty per cent of the text. Gates, Bond, and Russell [21], in reading experiments with pupils from second to eighth grade, found that "the lower the pupil's reading grade, the more conspicuous is the relative ease of the first and second thousand [words in the Thorndike list]." Lorge, in the experiments cited above [38], found that weighted index numbers given to all the 20,000 words in the Thorndike list had virtually the same prediction value as the simple proportion between the 769 "easy" words listed by Dale, and all other words.

It is hard to see how this particular difficulty can be overcome. In order to push the point of diminishing returns much higher than it is now, the word count would have to be extended to an enormous number of running words, possibly tens of millions.

A fourth objection has to do with sampling. If the relative proportion of uncommon words within the text is a measure of difficulty, it is logical that every short sample must appear more difficult than the text as a whole. This argument has been set forth by Dolch [14]. It means that this method forces every conscientious investigator to do the impossible: to count and weigh every word in every book he is dealing with.

Finally, there is a fifth argument which, the writer thinks, goes to the root of the matter. Even if we had a perfect frequency list, covering all possible occurrences and meanings in speech and print—even if we tested every piece of reading matter word for word—what would this method give us? It would

give us as an index of difficulty the number of words probably unfamiliar to the reader rather than those which, though familiar to him, are essentially abstract, ambiguous, or vague, or used with unfamiliar meanings, contexts, or overtones. To be sure, to the degree to which a reader does not know the language of the text, he will find reading harder or even impossible. But as a child grows older, as a foreigner learns the language better, or as a person gains reading and living experience, this aspect of reading difficulty becomes less important; and conversely, the more important become those differences in readability and clarity which are related to the words already familiar to the reader. This, to the writer, seems to be the reason why the survey of research by the National Conference on Research in English [45] arrived at the statement: "The frequency with which a word is used provides no sure index of difficulty." Another investigator, Young [87], summarizes his findings as follows: "The use of word lists to estimate the difficulty of a selection for any particular pupil has limitations." To put the matter even more sharply: it is not the number of uncommon words that makes one book harder than another. This is shown by the experiments of Wert [83] and Jackman [28], mentioned above, and by those of Witty and La Brant [84], who tested the ratio between common and uncommon words in twelve novels and found no significant differences between superior and inferior fiction, between classics and moderns, between Zane Grey and Edith Wharton. Some investigations by Thorndike himself point to similar conclusions. Thorndike found [74] that juvenile books differ from others not in their richness of common words but in the fact that their words tend to be more concrete. He and Lorge found [76] that in the *Encyclopedia Britannica* "words about food, drinks, games, emotions, love-making, clothes, flowers, animal pets, and business and work are scant, and words about civilization, history, politics, science, theology are frequent." Woody [85] ascertained the words in certain

textbooks that were unknown to a group of high school sophomores. One third of the words were among the first six thousand of the Thorndike list, one third between the sixth and tenth thousand, one third above the most frequent ten thousand. Only an insignificant number was not among the twenty thousand words listed.

In short, for reading beyond the stage of initial difficulty, of wrestling with specific unfamiliar words, the difficulty that arises from the use of uncommon words plays only a very minor role. Nolte [46], who tested over a thousand pupils with material in original and simplified form, found "no significant differences between comprehension of selections read in the original form and those read with reduced vocabularies," i.e., within the first 2,500 words of the Thorndike list. Stone [66], who gave reading tests to college freshmen, found no significant correlation between vocabulary difficulty, as measured by the Thorndike frequency list, and duration of eye fixations and number of regression movements. Correspondingly, statistics about "poorest" and "best" readers, given by Gray and Leary [25:115] furnish additional proof for the writer's theory. These data show the correlation of various vocabulary elements with reading test scores. The table, in excerpt, reads as follows:

Element	*All readers*	*"Best" readers*	*"Poorest" readers*
	r	*r*	*r*
Percentage of easy words	.520	.271	.529
Number of words not known to 90% of sixth grade pupils	−.513	−.218	−.550
Number of easy words	.511	.292	.518
Number of different hard words	−.496	−.191	−.543
Percentage of monosyllables	.433	.166	.488
Percentage of different words not known to 90% of sixth grade pupils	−.402	−.227	−.409
Percentage of different words	−.380	−.181	−.441
Percentage of polysyllables	−.380	−.077	−.428
Number of different words	−.291	−.075	−.367

Obviously, the test scores of readers with a certain degree of proficiency in reading are little influenced by the occurrence of different, hard, uncommon, or polysyllabic words. But if this is so, it holds true for a very large group within the adult population. The 1940 census shows that the average adult American has 8.4 years of schooling; and we know that vocabulary knowledge and reading ability tend to grow rather than decline after a person has left school (see Shakhow and Goldman [63], and Norris [47]). As a significant parallel, Lorge and Blau [39] found an average reading grade level of 9.2 among 242 tested adult WPA subjects. In other words, we may assume that the average American adult reads at least as well as a high school freshman. He has passed beyond the range of reading comprehension used by Washburne-Vogel, Gray-Leary, and Lorge as a criterion for their experiments. If a high rate of uncommon words in a passage is a significant obstacle in reading for children between third and seventh grade, this is not necessarily true for the average adult; the evidence seems conclusive that this factor has little influence upon his reading comprehension.

This investigation into the significance of frequently used words for comprehension, then, seems to confirm our earlier hypothesis that it is the emphasis upon the word recognition factor in reading comprehension that makes readability formulae less satisfactory whenever reading matter for adults rather than children is being tested.

We may next proceed to a closer inspection of that second factor which the Gray-Leary, Lorge, and Winnetka formulae have in common: complexity, or length, of sentence structure. It will be remembered that the Winnetka formula contains as one factor the ratio of simple sentences, whereas Gray-Leary and Lorge counted the average length of sentences in words. Obviously, the latter approach is only a simplified method of estimating the average degree of sentence complexity; the two

factors, according to Gray and Leary's findings, are correlated to the extent of .775 [25:129].

Whatever the technique used, a measure of sentence structure appears to be a good index of readability both at the children's level and at the adult level. Above all, it is well established in language theory that we read sentence by sentence, not word for word (see, for instance, Pillsbury and Meader [51:141]; also Schröder [62]). The great importance of the ability to understand sentence structure in the reading process was demonstrated by Gibbons [22], who tested the ability of pupils to arrange disarranged sentences and their ability to complete incomplete sentences. Gibbons found very high correlations between these two abilities and reading comprehension. Other experimental evidence shows the value of the sentence factor for determining the difficulty of adult reading matter: Gray and Leary [25:158–75] ranked popular magazines according to statistical counts of various style elements. With diversity of vocabulary as a criterion, *The Atlantic Monthly* appeared to be far easier than *Good Housekeeping; Science and Invention* far easier than *Country Gentleman.* However, when average length of sentences was made the basis of ranking, these obviously wrong estimates were reversed and the sequence of magazine titles seemed to correspond closely with the judgment of educational experts, starting with *Aces, All-Story,* and *All-Star Detective Story,* and ending with *Science and Invention, Atlantic Monthly, Rotarian, Radio News,* and *Review of Reviews.* Similarly, Jackman, in the experiments referred to above [28], compared the readability of novels according to the Gray-Leary formula with their "maturity" according to expert judgment. The statistical results showed that among the style elements measured by that formula sentence length was the only one that consistently pointed to the more "mature" novels as the more difficult reading matter.

The writer's second hypothesis was, then, that measures of sentence length or complexity do *not* account for the failure

of readability formulae for children's books to place adult reading matter in a satisfactory manner, or, positively, that such a factor should be retained if a new formula for adult reading material is to be constructed.

Having arrived at these two hypotheses, the writer was ready to test one of the existing formulae against material taken from general magazines or books for adults, with the expectation that such an experiment would show only little prediction value contributed by the word recognition factor, but fairly high prediction value contributed by the sentence length factor. The next problem was to define one or more new factors that promised added prediction value.

Going back to the experimental evidence about factors of reading comprehension, we see that the most influential factor given by Langsam [32] is the one termed V and interpreted as "seeing verbal relationships, logic, ideas, meaning." Davis's [9] Component II, ranking highest after Component I described above, is interpreted as "abstract reasoning." We can readily see the relationship between this element in reading comprehension with the sentence length or complexity factor in readability. Clearly, longer and more complex sentences demand for full understanding a higher capacity of seeing verbal relationships or of abstract reasoning. What other factor of difficulty can be defined to correspond to this important ability? The writer, following the line of thought expressed in Morriss' and Holversen's readability formula [43], decided to use the element of abstractness of ideas or words. It is obvious that words differ in their level of abstraction and generalization. These differences certainly must influence readability. Many writers have found factual evidence for this assumption. Ayer [1], who investigated difficulties in elementary school history, found that "comprehension is blocked to a great extent by difficulties unessential to history, especially figurative language and abstract words." Murphy [44] analyzed the role of the concept in reading ability. He tested students for richness of concepts (number

of associations with given words), organization of concepts (controlled association test), clarity (certainty in identifying the right meaning), and accuracy (discrimination between meanings) and correlated the test results with reading ability. He found no relation between reading ability and richness of concepts, but significant correlations between organization, clarity, and accuracy of concepts and reading ability. McClusky, in the experiments cited above [41], found a significant difference in comprehension according to the number of common concrete nouns. Reed [55] reported that easy prose was learned more quickly and retained better than abstract material. Lorge, in his application of the Morriss-Holversen technique [38], found that words signifying abstractness, quality, states of mind, had a correlation of .5739 with comprehension test scores, in spite of the fact that these words constituted only less than one per cent of the material used.

It is evident, then, that the proportion of abstract words is a usable element of readability. The difficulty here lies in the method of objective measurement. Gray and Leary decided not to use this element, because "in repeating several trial counts of abstract words in a selection, we noted frequent inaccuracies, probably for the reason that as a person becomes familiar with the many connotations of an abstract word the quality of abstractness is gradually lost. It seems that unless a word can be defined precisely as an abstraction, it cannot be considered objectively measurable." [25:106]

However, this factor seemed to be so highly important that the writer devised a working method to define abstractness objectively in order to make it usable for statistical experimentation. This "abstract words" factor was used in the writer's first experiment (see Chapter III) on the hypothesis that it would prove to have value in predicting the difficulty of reading matter for adults.

Another, somewhat different approach led the writer to experimentation with a second newly defined factor of readability.

This line of thought can be presented most clearly by quoting two excellent descriptions of the reading process in psychological terms. The first is Thorndike's classic passage:

> Reading is a very elaborate procedure, involving a weighing of each of many elements in a sentence, their organization in the proper relations one to another, the selection of certain of their connotations and the rejection of others, and the cooperation of many forces to determine final response. . . .
>
> In correct reading 1) each word produces a correct meaning, 2) each such element of meaning is given a correct weight in comparison with the others, and 3) the resulting ideas are examined and validated to make sure they satisfy the mental set or adjustment or purpose for whose sake the reading is done. Reading may be wrong or inadequate 1) because of wrong connections with the words singly, 2) because of over-potency or under-potency of elements, or 3) because of failure to treat the ideas produced by the reading as provisional, and so to inspect and welcome or reject them as they appear. . . .
>
> Understanding a paragraph is like solving a problem in mathematics. It consists in selecting the right elements of the situation and putting them together in the right relations, and also with the right amount of weight or influence or force for each. The mind is assailed as it were by every word in the paragraph. It must select, repress, soften, emphasize, correlate and organize, all under the influence of the right mental set or purpose or demand. . . .
>
> It thus appears that reading . . . involves the same sort of organization and analytic action of ideas as occur in thinking of supposedly higher sorts. [70]

Quite similar is the description of language comprehension in Henri Delacroix's fundamental book on *Language and Thought:*

> To understand a sentence is to give the words in it their value, both their direct signification and their functional, syntactical value by comprehending the construction, that is by reestablishing in our minds the interplay of relations it represents; it is to understand both the meaning of the words and the construction of the sentence.
>
> To understand the language is to understand the words and the grammatical forms; it is to put oneself, thanks to these forms, within a system of relationships concerning the things or events

signified by the words. It is to perform, by means of the signs, an intellectual adaptation to reality through these signs; an adaptation which seems immediate when the signs have become transparent; or a sketchy and tentative adaptation which, more often than not, remains possible without becoming actual.

To understand is to substitute for a series of heterogeneous sensations the order that assembles them and defines them by their reference to each other. To understand is to throw upon a system of things a net of relations, arranging the sensible, motor and intellectual elements in space and time, in the order of qualities, causes and ends. . . .

To understand, then, is to arrange notions. . . . [10:438 ff.]

Here we have an almost poetical, far from statistical description. However, it is Delacroix who gives us the clue to a purely statistical attack on our problem: "To understand is to arrange notions,"—and the keys to this arrangement of notions are the relational elements in the language—what linguists call the morphemes. "The semantemes carry the notions and the morphemes the relations," according to Delacroix. In Joseph Vendryes' *Language* [79:73–74] this highly important relationship is explained as follows:

Every sentence contains distinct elements of two kinds; on the one hand, the expression of a certain number of precepts representing ideas, and on the other, the indication of certain relations between them. If I say *The horse runs,* I have two ideas in my mind, a horse and running, and I unite the two in the statement *The horse runs.* . . . The distinction . . . is not a purely theoretical one. It corresponds to what we may call morphemes and semantemes.

By *semantemes* we understand the linguistic elements which express the ideas of the concept (*réprésentations*); in this case, the idea of the horse, or the idea of running; and by *morphemes* we understand those elements which express the connections between the ideas. Here, the fact of running which is connected in a general way with the horse, is referred to the third person singular indicative. Morphemes consequently express the relations established in the mind between the semantemes. . . .

Vendryes then goes on to explain that there are four kinds of morphemes: (1) Phonetic elements introduced into the sen-

tence and joined to the semantemes; these may be either (*a*) independent (separated in writing); or (*b*) affixed to semantemes. (2) Morphemes inherent in the nature or character of the phonetic elements of the semanteme, e.g. ablaut, accent. (3) The respective positions occupied by the semantemes in the sentence.

All this has been standard linguistic theory for many years (see, for instance, Gray [24]). It remains for us to relate it now to the readability problem. If the morphemes are the relational elements accounting largely for differences in the understanding of language, which of the above four types are susceptible to statistical measurement?

Group (1*a*), independent phonetic elements, separated in writing, includes prepositions, conjunctions, and similar categories of words. Gray and Leary and, following them, Lorge have used prepositional phrases as factors in the prediction of difficulty. Their statistical value was not very great, but still significant. Yet, an important objection to the use of these elements must be raised: Since all languages show a trend toward shortening and condensation (see Sherman [64], Zipf [88]) such language elements tend to be replaced in mature English by more concise ways of expression. In other words, at a certain stage of language development, prepositions and conjunctions are indices of greater difficulty; at another, higher stage, they indicate greater ease. *I heard the alarm. I got up* seems less difficult than *With the sound of the alarm I got up,* but this version in turn seems less difficult than *I got up, an alarm-slave.* If we take, in the case of constructions, frequency as an index of ease in understanding, we find that for 100,000 constructions of the first type, there are 21,820 of the second type, and 1,673 of the third (see Thorndike and others [75]). This group of morphemes has therefore a very complex relationship to reading difficulty. It seems to be of little promise as a possible factor in a statistical formula.

The second group of morphemes, those affixed to seman-

temes, seemed to the writer a highly promising prediction factor. The count of affixes is, obviously, a simple shortcut to the count of abstractions. The hypothesis seemed justified that a count of affixes like the count of abstract words would show a close relationship to differences in the capacity of "seeing verbal relationships" or of abstract reasoning on the part of the readers.

The third type of morphemes—ablaut, accent, etc.—is sometimes indiscernible in print, except by way of the context, and therefore highly impractical as an element in a statistical formula. To build a scientific tool on differences like that between *refuse* (verb) and *refuse* (noun) would be an invitation to inaccuracy.

Finally we come to the fourth kind of morphemes: the "word-order" morpheme. We have already discussed a factor very clearly related to this element: complexity or length of sentences. The morpheme approach only confirms what has been said above about the value of that factor.

On the basis of this theoretical investigation, then, the writer chose the Lorge formula among the existing readability formulae for an experiment with reading matter for adults. His hypotheses were: (1) that the first and most heavily weighted factor in that formula—number of "hard," that is uncommon, words—would fail to differentiate such material satisfactorily; (2) that the second factor in the Lorge formula—length of sentences in words—would retain its high prediction value on this level; (3) that "abstract words" would be a good index of difficulty; and (4) that "affixed morphemes" would be a good index of difficulty.

Chapter III

AN EXPERIMENT WITH MAGAZINE ARTICLES

In the construction of the writer's experiment the first task was to find a valid criterion of difficulty for adult reading matter. For lack of anything better, like an extensive collection of reading tests of a large adult population—nothing even approaching such a criterion is available at present—the writer decided to use a scale of widely read magazines. It is well established that reading of certain magazines furnishes a good index of socio-economic as well as educational level. The findings and observations of educators, psychologists, sociologists, publishers, and librarians supplement and confirm each other in this respect to a surprising degree (see Wert [83], Buswell [5], Miller [42], Taylor [68], Flexner and Hopkins [19], Warner and Lunt [81]). Even subjective rating of magazines according to their "cultural value" by a panel of forty-four judges resulted in a similar rank order (see Kerr and Remmers [31a]). The writer, using the aggregate of these findings and observations as a guide, devised the following scheme:

Articles published in the *Reader's Digest* were assumed to exemplify magazine non-fiction writing of average style difficulty. Among the magazines frequently used as source material for the *Reader's Digest* five were selected as representing high quality, sophistication, literary style, and five others for their low quality, mass appeal, and popular style. Further, five magazines were chosen among the confessional, detective, and movie magazines which are disregarded by the *Reader's Digest*. Finally, five magazines were selected, representing scholarly, academic writing, beyond the "upper limit" of *Reader's Digest*

readers. This grouping in five levels corresponded closely to the findings and observations mentioned above; the magazines appeared to be typical of five clearly distinguishable levels of difficulty. The magazines used were:

Level A *Modern Screen*
Official Detective
Romantic Story
True Confessions
True Detective Mysteries

Level B *Cosmopolitan*
Liberty
McCall's Magazine
Redbook Magazine
Woman's Home Companion

Level C *Reader's Digest* (five different issues)

Level D *The Atlantic Monthly*
Fortune
Harper's Magazine
The New Yorker
The Saturday Review of Literature

Level E *The American Scholar*
The Annals of the American Academy of Political and Social Science
Foreign Affairs
The Virginia Quarterly Review
The Yale Review

Randomly selected recent issues were used for the experiment. Within each issue, five randomly selected articles of a factual nature were tested by sampling three passages of a hundred words each. This procedure gave 375 test passages. The style elements measured were:

The three factors making up the Lorge Readability Index, namely:

(1) Number of different hard words (not included in the Dale list of 769 easy words);

(2) Number of prepositional phrases;

(3) Average sentence length in words;
and two factors defined by the writer:

(4) Number of abstract words;

(5) Number of affixed morphemes.

The writer's working definitions were as follows:

An abstract word was arbitrarily defined as one of a list of 13,918 words, selected by the writer from the *Thorndike Century Senior Dictionary* [73]. Following the views expressed by many modern philosophers, abstractness or concreteness of words is a matter of degree and of context (see, for instance, Dewey [12:351f.]). An abstract word as such does not exist, unless we define the term arbitrarily as a word which is most frequently used for the sake of its connotations (the properties implied by it) rather than its denotation (the thing it applies to) (see Richards [56:385]). To assemble a list of "abstract words" in this sense the writer used the dictionary—not as a list of authentic definitions, but simply as a list of certain word meanings most frequently used. The *Thorndike Century Senior Dictionary* proved to be particularly useful for that purpose since the meanings for each word are given in the order in which they appear in Lorge and Thorndike's *English Semantic Count* [37]. To keep his list of "abstract words" within reasonable bounds, the writer disregarded all proper names and capitalized words in general, all strictly technical, legal, musical, etc., terms, and all words within the first three thousand of the Thorndike list. Among the remaining words, those were considered as abstract whose prevailing meanings were connotative rather than denotative. For instance, from a random page the following words were taken:

medievalism	meditate	medley
medievalist	meditation	meed
mediocre	meditative	meek
mediocrity	medium	etc.

Abstract words were then counted by checking the words found in the passages against the prepared list.

An affixed morpheme was considered to be any language element which is distinguishable in print and which indicates a certain mental operation concerning the semanteme it is affixed to. Every affixed morpheme, thus defined, was counted, with the exception of the most frequent ones: ending –s (any meaning), the plural ending –en, and ending –d or –t in: could, did, had, might, ought, should, stood, went, would. These exceptions were made to shorten the count, since obviously the most frequent morphemes are least indicative of difficulty. (For more details, lists of affixes, and examples, see Appendix A.)

After measuring the five style elements and ascertaining the

TABLE 1

MEANS OF THE THREE STYLE ELEMENTS USED IN THE LORGE READABILITY INDEX, ON FIVE MAGAZINE LEVELS

	Number of different hard words	*Number of prepositional phrases*	*Average sentence length in words*
Level A	26.01	8.95	14.64
Level B	25.90	10.24	17.33
Level C	30.75	9.61	16.64
Level D	31.37	11.60	23.20
Level E	34.06	13.48	25.97
Total	29.62	10.84	18.69

TABLE 2

MEANS AND STANDARD DEVIATIONS OF LORGE READABILITY INDEX AND TWO "NEW" STYLE ELEMENTS, ON FIVE MAGAZINE LEVELS

	Lorge Readability Index		*Number of affixed morphemes*		*Number of abstract words*	
	$\overline{X}$	s	$\overline{X}$	s	$\overline{X}$	s
Level A	6.72	1.20	27.32	8.98	3.68	2.33
Level B	7.34	1.65	30.60	8.59	5.13	2.91
Level C	7.42	1.04	37.24	11.50	6.72	3.90
Level D	8.41	1.31	39.56	11.58	7.23	3.79
Level E	9.01	1.03	48.96	9.86	10.91	3.78
Total	7.78	1.51	36.34	12.70	6.73	4.22

TABLE 3

CORRELATION RATIOS BETWEEN MAGAZINE LEVELS (L) AND STYLE ELEMENTS AND LORGE READABILITY INDEX (E)

	η_{LE}	η_{EL}
Number of different hard words	.4425	.5029
Number of prepositional phrases	.3738	.4645
Average sentence length in words	.4886	.5087
Lorge Readability Index	.5484	.6207
Number of affixed morphemes	.5918	.6258
Number of abstract words	.5761	.5741

TABLE 4

COEFFICIENTS OF CORRELATION BETWEEN LORGE READABILITY INDEX (R) AND TWO "NEW" STYLE ELEMENTS: NUMBER OF AFFIXED MORPHEMES (M) AND NUMBER OF ABSTRACT WORDS (A), ON FIVE MAGAZINE LEVELS

	r_{RM}	r_{RA}
Level A	.5564	.4060
Level B	.4582	.3097
Level C	.5735	.4579
Level D	.4430	.4778
Level E	.0514	.1878
Total	.5701	.5289

Lorge Readability Index for each passage, statistical measures of central tendency, dispersion, and correlation were computed. The results are shown in Tables 1 to 4.

The coefficient of correlation between the two "new" style elements, number of affixed morphemes and number of abstract words, for the total distribution of the 375 passages was found to be .7849.

To interpret the findings of this experiment, we may first consider the data concerning the "hard words" factor, the one built upon the Dale list and thus indirectly upon the Thorndike *Teacher's Word Book*. We see that this element, for which Lorge found an average frequency of 17.42 per hundred words among the *Standard Test Lessons in Reading*, averages 26.01 for magazines of the *Romantic Story* type and 34.06 for maga-

zines of the *Yale Review* type. In other words, the difference between the average number of "hard" (uncommon) words found in children's reading and the corresponding average for extremely easy material on the adult level is somewhat greater than the biggest difference within the whole gamut of adult reading matter. This factor, as the present experiment clearly shows, is in essence a measurement of the "adultness" of reading matter, which makes it, of course, unsuitable as a tool for the differentiation between various types of equally "adult" material.

Lorge's next factor, number of prepositional phrases per hundred words, shows only little increase along the five-level magazine scale. As Table 3 shows, the prediction value of this element is lowest among all elements tested.

Lorge had found an average sentence length of 16.80 words when he tested the *Standard Test Lessons in Reading.* The range for the magazine scale is from 14.64 to 25.97 words. This factor, then, not only shows a considerable increase within the five magazine levels, but also shows a reasonable relationship between reading matter for children and for adults. Confirming the writer's hypothesis, its prediction value was highest among the elements of the Lorge formula.

Abstract words and affixed morphemes proved to be closely correlated to each other ($r = .7849$). Both were shown to be better indices of difficulty for adult reading matter than the combined Lorge Readability Index (see Table 3). At Level E the correlation between these two factors and the Lorge Readability Index virtually disappears, which means that, if abstractness is a true sign of difficulty, the Lorge formula does not operate at that level.

Especially significant are the very high average figures for affixes and abstract words at Level E. In other words, there is a marked difference in abstractness between general and scientific English prose.

The writer's hypotheses, then, were borne out by the out-

come of this experiment. When reading matter for adults was tested, frequency of uncommon words proved to decrease in its readability prediction value with mounting difficulty of the text; whereas sentence length, number of abstract words, and number of affixed morphemes showed their value as indices of readability even for highly difficult material.

Chapter IV

AN EXPERIMENT WITH READING LESSONS

IT WAS NATURAL, after the satisfactory results of the magazine experiment, that the writer next attempted to construct a new regression formula embodying his findings. The five-level scale of magazines that had been used as a criterion was too crude to be a satisfactory basis for such a formula. But, as was pointed out above, a more reliable criterion on the adult level was not available. On the other hand, the most extensive collection of reading test passages was the 376 McCall-Crabbs *Standard Test Lessons in Reading*, the criterion used for the construction of the Lorge formula. Here was the opportunity, then, to compare the writer's findings with Lorge's earlier results and to test the relationship of the new factors to reading comprehension at the children's level. Applying to reading matter for adults a readability formula based on that criterion had, of course, to depend upon extrapolation.

For this second experiment the writer decided to drop the count of abstract words. The first experiment had shown that the count of affixes was a practically equivalent measure of abstractness ($r = .7849$), and the latter method was far less cumbersome.

On the other hand, the author used this opportunity to test another potential element of readability. It may be recalled at this point that the writer's experiments originated in the Readability Laboratory where readability was practically defined as a combination of "lucidity, comprehensibility, and appeal." Measures of abstract words and morphemes apparently tested lucidity and comprehensibility, but the appeal element seemed

to defy any statistical approach through characteristics of style. Group interests in reading can be ascertained by using Waples' ingenious technique, but the problem of a specific book's appeal for a given reader remains. A technical article on radio physics will be easy for the amateur, a difficult piece on Chinese art will be light reading for the collector. In contrast, one man's meat being another man's poison, a book catering to a special interest will be particularly unappealing to the rest of the reading public. It is very easy to overrate this aspect of readability and thus to reduce reading difficulty to the difficulty of the subject involved.

But there is, fortunately, one topic everybody is interested in—people. As everyone knows, readers enjoy fiction more than non-fiction. There is a general preference for "stories," not only among children (see Garnett [20], Engleman [17]) but also among adults. It is the most commonplace generalization about reading that can be made. Shrewd popularizers know well why they write *The Story of* this and *The Story of* that. Human interest obviously is by far the most potent factor of appeal. A statistical approach to this element was indicated by Gray and Leary's count of personal pronouns. Subsequently, this element proved to be of so little additional prediction value that Lorge, in his modification of the Gray-Leary technique, dropped it from the regression formula. However, it seemed capable of being improved; the writer decided, in order to gain a true measure of human interest, to disregard all neuter personal pronouns, and to add to the count all references to persons either by names or by words meaning people as such or their mutual relations. (For exact directions and list see Appendix A.)

The author's procedure was, then, to determine in each of the 376 McCall-Crabbs *Standard Test Lessons in Reading* the number of affixed morphemes per hundred words and the number of personal references per hundred words. Intercorrelations, based on grouped data, were computed between these

two factors, and average sentence length in words, as measured previously by Lorge, and the criterion, namely, the grade score of a child who could answer one-half of the test questions correctly (see Table 5).

Table 5

Intercorrelations Between Average Sentence Length in Words (S), Number of Affixed Morphemes (M), Number of Personal References (H), and Grade Score of a Child Who Answered One-half the Test Questions (C_{50})

	M	H	C_{50}	$\overline{X}$	s
S	.4385	−.2241	.6174	16.8039	6.3761
M		−.3216	.5967	25.1342	11.0901
H			−.3881	7.3457	5.5175
C_{50}				5.7493	2.0222

Finally, a regression formula—corrected, following Lorge, by adding a constant of 1.8860 to indicate the average grade score of a child who answered three-quarters of the test questions correctly—was computed as follows:

$$X_{C_{75}} = .1338X_S + .0645X_M - .0659X_H + 4.2498$$

The corresponding multiple correlation coefficient was found to be $R_{C_{75} \cdot HMS} = .7358$, with a standard deviation of 1.3694 reading grades.

Interpreting these findings, we see that both sentence length and affixed morphemes show fairly high correlations with the criterion (.6174 and .5967). The "human interest" factor also shows a clearly significant relationship with comprehension difficulty ($r = -.3881$). This seems to be one more evidence —confirming modern theories of educational psychology—that interest makes for better learning. "Appeal," for a passage or a book, is not only an adornment and a selling point, but an educational asset and a factor of better understanding.

The newly constructed regression formula whose prediction value is expressed in the multiple correlation coefficient of .7358 appears to be satisfactory at the level of the *Standard Test*

Lessons in Reading, that is, third to seventh grade. It may be used safely as an index of difficulty for children's reading between these levels, where its prediction value is a trifle lower but not significantly different from that of the combined indices used in Lorge's experiments. But the point made throughout this study is that the Lorge, Gray-Leary, and other formulae are less satisfactory if applied to adult reading matter. Does the new formula fill the gap? At this crucial point, the writer must rely on extrapolation, on the findings of the first experiment, and on further experience with the formula as a measure of adult reading difficulty. After a large number of satisfactory tests, the writer has established certain "magazine levels" corresponding to the grade placement (see Table 6). (These levels differ slightly from those in the first experiment because of the newly introduced "human interest" factor.) Table 6 also shows the estimated corrected grade placement for the area of extrapolation beyond seventh grade.

TABLE 6

Reading grade placement by formula	*Typical magazine*	*Reading grade placement (estimated correction)*
5.9 and below	(none)	5.9 and below
6.0 to 6.9	*True Story*	6.0 to 6.9
7.0 to 7.9	*Liberty*	7.0 to 7.9
8.0 to 8.9	*Reader's Digest*	8.0 to 9.9
9.0 to 9.9	*Harper's Magazine*	10.0 to 12.9
10.0 to 10.9	*Yale Review*	13.0 to 16.9 (college)
11.0 and above	*Scientific Monthly*	17.0 and above (college graduate)

In general, the writer found the formula useful to distinguish not only between grade levels of reading matter for children, but also between various types of adult reading matter; the examples given in Appendix B show a clear progression of difficulty. This indirect evidence, added to the statistical results of the two experiments, confirms the writer's hypothesis that a combined formula, based on the number of affixed morphemes, average sentence length in words, and number of per-

sonal references, may be used as a tool for estimating the readability of adult reading matter. The predominant influence of the morpheme factors shows, in particular, that reconstruction of the logical structure of the sentences, and correct determination of the interplay of relationships between notions account to a large degree for differences in reading comprehension. In other words, what makes reading hard is not the words but what is said between them.

Chapter V

SOME APPLICATIONS

SINCE THE INVESTIGATION reported here led to the construction of a statistical tool for measuring readability, it seems appropriate to devote this final chapter to the discussion of some possible applications.

The writer is well aware that many obstacles stand in the way of a scientific approach to readable prose. Writing is an art; so is the appreciation of literature. Every writer who knows his trade naturally thinks that his experience is the best guide to how to approach his readers; every book reviewer is convinced that he can tell exactly how readable a book is. This is the kind of opposition to the present approach that may be called the vested interest of the expert practitioner. It is based on the belief that literature and language naturally defy any scientific or statistical approach.

Another type of argument that may be expected would assert that there are *not enough* scientific rules to this method, that it is too loose and unsystematic. Some adherents of Basic English, for instance, insist that the true way to simple English is limitation to the 850 words and the few grammatical rules of Basic English. The writer's theory, as presented here, points indeed in a different direction. Simple, easily understandable English, as has been shown, can be achieved by using short sentences, few affixed morphemes, and many references to people. Such a streamlined, short-elements language is exactly what the past development of English seems to approximate. This gradual popularization—even vulgarization—of English as well as other languages has often been observed and described

(see Sherman [64], Zipf [88]). The kind of English that would be extremely readable in terms of the writer's formula can be heard today in places where "marginal English" is spoken, and it will probably increase in importance if present trends of language development continue. Such a language is, for instance, Pidgin English, or the idiom a foreign tourist uses in talking to a waiter or barber. It is this kind of popular language that is suggested by the writer's formula, rather than the artificial, over-logical Basic English.

The latter has been invented, as is well known, for the specific purpose of furnishing a simple language for international communication. It seems not impossible to the writer that easy, simplified English of the kind indicated in this study could be put to good use as an idiom for translation and international understanding.

Turning our attention away from these wider aspects we may now consider the possible application of this method to writing and the selection of reading matter.

It seems necessary to start this discussion by pointing out the limitations of the formula. It must be clearly realized that it cannot do everything; it can *not* automatically uncover a specific book to suit an individual reader, and it will not by itself produce readable English prose.

Above all, there is the specific difficulty or appeal lying in the subject matter. Obviously, even the most readable style cannot make astrophysics an easy subject; on the other hand, a reader who is genuinely interested in it, will possibly overcome all stylistic hurdles. Yet, as has been said above, it is easy to overestimate this aspect, and even astrophysics can be presented in popular style to the lay reader.

Another general factor of readability is brevity. It needs no scientific proof that readers prefer short articles or books to fat tomes. It is one of the most serious problems for the popularizer that this factor has to be reconciled with the principles embodied in our formula. The use of fewer affixes and short

sentences and the introduction of people quite obviously lead to the use of more words in order to express the same amount of ideas. As the writer's experiments show, simplification means mainly a loosening up of the text, a decrease in density. This density of language—crowding many concepts into a few words—has been discussed by writers as diverse as Lyman Bryson [3], Walter B. Pitkin [52], and Ezra Pound [53]. It is, we may say, the one single quality of language measured by all three factors in the formula. To be readable, then, a book has to be short without being dense. This Readability Rule Number One is rarely understood by writers of popular non-fiction, who either ramble along for hundreds of pages or try to pack everything about a subject into minimum space. Some of the *Public Affairs Pamphlets* [54] exemplify very well how over-conciseness decreases readability.

It seems important in this connection to make clear what the writer means by a popular non-fiction book, a "layman's book." It is, on the one hand, an instrument for the dissemination of knowledge, not for a contribution to knowledge. This fact is often overlooked. Some writers seem to think that they can accomplish both these ends at the same time. But books written in this manner—and there is an abundance of them—are usually not taken seriously by the author's peers and unreadable for the layman.

On the other hand, among the books dedicated to the dissemination of knowledge, "layman's books" must be distinguished from textbooks. A layman's book is a book for self-education; a textbook, even if disguised as a trade-book, is a book to teach with. The traditional features of a textbook are designed to correspond to lectures and classroom teaching. The student who attempts to teach himself with a textbook is confronted by two problems at once: that of mastering the subject matter and that of devising and carrying through proper methods of self-instruction. The "layman's book," then, is neither an original contribution to knowledge nor a textbook; it forms

a category of its own as a printed tool for self-education, "a new form of literature for a new type of reader" (Clarke [6]).

It is for this form of literature that a measurement of readability is important. And it might be well at this point to limit the applicability of the formula even further; to set down here certain empiric rules the writer has derived from his extensive bibliographical experience with books of this type. The six points which follow correspond, of course, to the accepted doctrines of educational psychology. They are listed here as a further reminder that the statistically measurable factors account for only part of a book's readability. They may be formulated as follows:

1. A popular non-fiction book should have a "learning plot," that is, it should show one or more characters in the process of learning by problem-solving.
2. It should build up, at length, a strong motivation for learning and should provide the reader with clear and obvious reasons for finding out about the subject matter.
3. It should provide the reader with explicit directions within the running text, showing him how to study, what to read with special attention, what and when to review, what to memorize, and so on.
4. It should point out in the running text the exact significance of illustrations, both verbal (examples, allegories) and non-verbal (pictures, tables, graphs).
5. It should repeat material wherever necessary.
6. It should be organized according to a simple general pattern so that its outline can be kept clearly in mind throughout the reading.

The writer thinks that these six points, together with his formula, give a working recipe for the writing of popular, readable non-fiction books. To illustrate the application of the formula, we may now inspect somewhat closer the examples

given in Appendix B. The first example is a little story for children:

One day a little Chinese boy of eight, named Wenkung, was playing with his brother Venyao in a garden. Suddenly, Venyao fell into a big vessel full of water. Wenkung tried to pull his brother out, but found that he was neither tall enough nor strong enough. Soon he picked up a stone and broke the vessel. The water flowed out and his brother was saved. Wenkung later became a great man.

This is fifth grade reading: the grade placement by the writer's formula (5.6) corresponds to the average grade of the children who answered three-quarters of the test questions correctly (5.4).

The next passage is typical for the style of the confessional magazines:

I was in the store when Russ came in, and the first time our eyes met I felt lost. I had never met a man like him before. He was bluff and hearty, brimming over with good humor. He was good looking, with black hair and dark eyes. When he smiled you felt the force of his personality, and he smiled often in those days. I guess he felt the same way I did, because he lost no time in asking me for a date. It wasn't long before we knew we were in love, but it was two years before we married.

The difference between this passage and the first one may seem slight; but it is significant as an indication of the difference between very easy reading matter for children and for adults.

The next passage given in Appendix B was taken from *Liberty Magazine*. It is quite similar to the second one—the same sort of simple story-writing, but slightly more "dressed up." The fourth passage, taken from an original article for the *Reader's Digest* by Paul de Kruif, is a model of highly skillful popularization—readability achieved by a past master in easy exposition:

All right, then, it's agreed that, despite all we've read about diet and vitamins, many of us still don't have the right foods; if we did

many of us could literally eat our way to better health. But what, specifically, should we eat? Isn't that a question which is clear only to nutritional specialists who make out complicated and confusing dietary lists?

No. For normal living the answer is simple. It's as simple as being sure to eat grapefruit, oranges or tomatoes, with their C vitamins, every day; it's as simple as drinking milk daily. (Milk, cheese, butter, eggs are teeming with vital food elements, infinitely more valuable than the starches, sugar and fats which we overeat.)

The fifth and sixth passage given in Appendix B are samples of literary writing, of the simple and the more elaborate type. The final example is typical scientific prose:

Anthropologists have long recognized that the spread of customs from one group of people to another—"diffusion" in anthropological terminology—accounts for at least nine tenths of the culture of any group. On its face, this would seem to assign any kind of economic determinism an insignificant role. An analysis of this problem, however, in the light of what is known of culture change among primitive peoples, both before and after they have experienced acculturation resulting from contact with European cultures, exposes its considerable complexity. Under certain conditions, subsistence patterns—that is, the activities concerned with acquiring food, clothing, shelter and other things indispensable to existence—have imposed very narrow limits on possible variations of social and economic organization. Under other conditions, it is evident that considerable latitude is possible in the socio-economic structure.

Now, it is, of course, not the writer's advice to popularizers to imitate the style of the confessional magazines. Even less does the writer intend to do away with certain literary style values, although, to be sure, they may contribute to reading difficulty. But who would want to approach in this fashion masters of English prose, like George Santayana or Aldous Huxley? "Rewriting the classics"—past or contemporary—would be vandalism indeed.

However, it must be obvious to every reader of this study that for the dissemination of knowledge Paul de Kruif's style is vastly preferable to that of our sample passage on the subject

of anthropology. De Kruif can be understood by the average American; so can Stuart Chase, George W. Gray, Gove Hambidge, Bernard Jaffe, Walter B. Pitkin, Paul B. Sears, and Hendrik Willem van Loon—to name a few "model popularizers." The author's formula offers help in approaching the readability of such writers; and if a writer wants to address himself to habitual readers of magazines of the *True Story* type, he might very well use the formula to simplify his style even further.

The formula may be used by writers in two ways: generally as a continual reminder to be concrete, to use short sentences and to bring in people; and specifically as a repeated check whether the writing is actually geared to the reading capacities of the prospective readers. Naturally, not only writers of popular books and materials for adult education may make such use of the formula, but also textbook authors, magazine editors, publisher's readers, and advertising copy writers.

Writers for a radio audience may well supplement this method with certain recent findings about the relationship between reading and listening comprehension. Goldstein [23] has found significant differences in favor of listening comprehension for third grade reading, but no reliable differences for seventh grade material. Larsen and Feder [33] have found listening superior for easy passages, reading superior for passages of medium difficulty, and a very pronounced difference in favor of reading for difficult material. In other words, if material is put on the air rather than on the printed page, easy matter becomes easier but difficult matter more difficult. Radio will therefore magnify differentials in difficulty as detected by the writer's formula.

The writer is, of course, aware that the application of his formula amounts to an exhortation to authors to use good journalistic style. For the many scientists who undertake to write popular books and articles without having the requirements for such a task, this will certainly be very healthy advice;

and to professional writers these findings offer scientific proof that they will be well understood as long as they write according to good newspaper tradition.

After all, it would be ridiculous to tell a writer to use only a limited number of prepositions or to keep within a three-thousand-words vocabulary. Not only that, such a method would be misleading. Simplification, like writing of easy prose in general, is a hard job. There are no simple shortcuts. What the writer's formula suggests is a process of careful analysis and decomposition of words and sentences, and continual emphasis upon the human side of the ideas expressed. An example of such a scientific simplification is to be found in Appendix C.

Some time ago, the writer tried to find out how the readable, even style of the *Reader's Digest* was achieved. But the editor he talked to had no explanation to offer. The style of the *Reader's Digest* is nothing but the natural product of the process of selecting and cutting. However, one of the editor's remarks could serve as a motto for any popular writer: "Whenever we want to draw attention to a problem," he said, "we wait until somebody does something about it. Then we print the story how he did it."

The uses of the formula for library service are of a somewhat different nature. The librarian, and especially the readers' adviser, is confronted by the problem of selection from a large number of books for use by individuals or groups of readers with certain purposes and capacities. Heretofore, the choice of a book among various titles covering the same subject was entrusted to the experience and skill of the individual librarian. But even the best librarian cannot possibly know all books in all fields. She can hardly do more than guess when a reader asks for a good simple book on economics and she has to pick a title from the following list:

Getting and Spending; The ABC of Economics, by Mildred Adams
A Primer of Economics, by Stuart Chase

Economics, An Introduction for the General Reader, by Henry Clay
Economics for Everybody, by Mervyn Crobaugh
Economics for the Million, by Henry P. Fairchild
Economics in a Nutshell, by L. H. Haney
Man's Worldly Goods; The Story of the Wealth of Nations, by Leo Huberman
The Useful Art of Economics, by George Soule
Economic Institutions, by Willard L. Thorp

Nine popular introductions to economic theory—seemingly on the same level, yet actually ranging from grade school reading to college text, from newspaper article to scientific treatise, from simple instruction to preaching a doctrine. How is the librarian to find "the right book for the right reader"? The readability formula, together with the other readability factors mentioned above, offers the solution for this type of problem. The formula can be applied by any librarian, without prohibitive labor; or it may be worked out in advance for the more important popular non-fiction books by one of the national bibliographical services. (Centralized readability rating is a feature of the library system in Soviet Russia, see Russell [61:23]). The result would be a "horizontal" as against a "vertical" classification of books. Librarians may thus be given a means to think of their books in terms of various degrees of readability instead of divisions according to subject matter. This would be a new and very healthy way of looking at a library. If we apply a parallel classification to readers, we may derive the following picture from the 1940 census reports and from sociological studies like Miller's [42] in Chicago or Warner and Lunt's [81] in "Yankee City": 13.5 per cent of the adult population over 25 years of age are functionally illiterate, that is, non-readers; at the other end of the scale, 10.1 per cent have at least one year of college education—at this level we find the readers of magazines of the *Harper's* or *Atlantic* type; among the remaining three-quarters of the total adult population of the United States, maybe one-half, at the lower level, prefer

the confessional, adventure, and detective magazines, and the other, upper half read the family and women's magazines, and weeklies of the *Saturday Evening Post* type. A parallel classification of the non-fiction books in an average public library along "horizontal" readability lines would probably show that 90 per cent of them are for the educationally privileged 10 per cent, and 10 per cent are for the "*Saturday Evening Post*-readers"; to the other half of the population the average public library has no non-fiction to offer.

In most public libraries, books in foreign languages are marked F for French, G for German, etc., and placed on separate shelves. It may be said with some justification that easy English and difficult English, since they can be distinguished objectively, are two different languages. The writer does not think it an impossible suggestion to mark readable books with an E—for Easy English—and reserve a special place for them. Many librarians will object on the ground of "too much condescension." The writer does not think this a valid argument. He thinks that most readers would be grateful for such a practical new arrangement. They would certainly prefer it to the present system of "browsing" among Veblen, Keynes, and Hansen in order to find—by an odd chance—a simple book on economics.

But this may seem far-fetched. What can be done immediately is that readers' advisers ask library patrons for their favorite magazines and then give their reading suggestions accordingly, and that the selection of non-fiction for purchase be based on a similar approach.

Aside from its applications for adult education, the formula may also be used in connection with the teaching of English in schools. Textbooks and general reading matter may be selected on this basis; and the wider implications of this investigation point in the direction of less vocabulary drill, more teaching of prefixes and suffixes along the lines suggested by Thorndike

[72] and Stauffer [65], more intensive instruction in reading, and possibly more emphasis upon the study of Latin and Greek. In English composition students might be taught the concept of language density and its implications; they might study, for instance, how the sweep of long sentences in classical English prose is counterbalanced by lack of affixes and concreteness of expression.

Finally, problems of mass communication are of increasing importance for the processes of democratic government. The logical prerequisite for the "consent of the governed" is mutual understanding between the government and the people. The recent broadening of the income tax base necessitated the simplification of the blanks; the selling of government bonds and stamps at prices upward from a dime forced Uncle Sam to use popular language in his appeals; the General Maximum Price Regulation had to be published together with an official explanation in question-and-answer form. Scientific simplification of language along the lines indicated in this study should prove a useful tool for the government. At present, the language of Washington is not always that of the rest of the country. A recent newspaper story may serve as a humorous illustration [69]:

> WASHINGTON, March 10, 1942—The polished polysyllabic profundities of James M. Landis, dean of the Harvard Law School and Director of Civilian Defense, seem to be a little too fancy for President Roosevelt.
>
> The Chief Executive read to a press conference today a letter which Dean Landis had prepared for him to send to the Federal Works Agency on the subject of blacking out Federal buildings during air raids.
>
> "Such preparations shall be made," the letter said, "as will completely obscure all Federal buildings and non-Federal buildings occupied by the Federal Government during an air raid for any period of time from visibility by reason of internal or external illumination. Such obscuration may be obtained either by blackout construction or by termination of the illumination."
>
> With a grin, Mr. Roosevelt hastened to remark that "obscura-

tion" was not his word, nor was "termination of the illumination" his language.

He read on.

"This will, of course, require that in building areas in which production must continue during the blackout, construction must be provided that internal illumination may continue."

Mr. Roosevelt asserted that he knew some people who had had internal illumination, and after a roar of laughter subsided, he continued once more with the letter:

"Other areas, whether or not occupied by personnel, may be obscured by terminating the illumination."

The Chief Executive stopped, turned to his press secretary, Stephen Early, and ordered a rewrite job.

"Tell them," he said, "that in buildings where they have to keep the work going, to put something across the window. In buildings where they can afford to let the work stop for a while, turn out the lights. Stop there," he ordered.

Application of the writer's formula to the two versions placed the OCD-version at the thirteenth grade and the presidential one at the sixth grade. In other words, Dean Landis wrote academic jargon, and Mr. Roosevelt talked the language of the people.

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Appendix

Appendix A

HOW TO USE THE READABILITY FORMULA

The statistical readability formula is a means of gauging the ease and interest with which a book, article, or story will be read. The estimate is expressed in a figure that indicates the reading-grade at which the average school child will be able to answer about three-quarters of the questions in a reading comprehension test concerning detail, appreciation, import, vocabulary, and concepts of the text, with adequate completeness and correctness. Thus a reading grade placement of 5.4 for a passage indicates material at the fifth grade, that is, within the reading comprehension of average fifth grade children. For adult readers, this grade placement may be converted into an estimate of the reader's "magazine reading level," indicating the type of magazine comparable in ease and interest of style to the tested passage. Material can then be selected with a view to magazines read or preferred by the specific audience or individual.

1. *Selecting the samples.*

Unless a whole text is analyzed, samples of a hundred words each should be chosen according to a definite scheme, e.g., every fifth paragraph or every tenth page. For an average article or story of about three thousand words, not less than three hundred words should be sampled. Longer articles or books require, of course, more samples. Each sample should start at the beginning of a paragraph.

2. *Counting the number of words.*

Count each word up to a hundred. Hyphenated words and contractions are counted as one word. Numbers and letters are

counted as words. As a rule, count all the words and other items that are separated by white space.

3. *Computing the average sentence length in words (the "sentence factor," X_S).*

Find the sentence ending nearest to the hundred-word mark, e.g., at the 94th word or at the 109th word. Count the sentences up to that point and divide the number of words by their number; if in doubt what is to be considered a sentence, follow the units of thought rather than the punctuation: sometimes sentences are marked off by colons and semi-colons instead of periods—like these.

4. *Counting the number of affixes (the "morpheme factor" X_M).*

An affix is "an addition placed at the beginning or end of a root, stem, or word, to modify its meaning (*Oxford Dictionary*). Count all the affixes within the hundred-word sample. If the text has more or less than a hundred words, compute the number of affixes per hundred words. Disregard capitalizations. Affixes may be inflectional endings, prefixes, suffixes, foreign endings.

INFLECTIONAL ENDINGS:

Verbs: -ing, -ed, -d, -t, -en, -n; e.g., doing, lived, said, meant, written, been
Adjectives and adverbs: -er, -est, -st; e.g., better, highest, first
Adverbs: -ly; e.g., slightly, only
Numbers: -ty, -th; e.g., twenty, fourth

EXCEPTIONS: Do not count -es or -s when used to form plurals, possessives, or a third person singular. Do not count -en when used to form plurals. Do not count ending -d or -t in: could, did, had, might, ought, should, stood, went, would.

LIST OF PREFIXES, WITH EXAMPLES:

a-	about, amoral, avert, achieve	ac-	accord
		ad-	admit
ab-	abhor	af-	afford
abs-	abstract	after-	afternoon

ag-	aggressive
al-	allocate, already
am-	ambiguous
amphi-	amphibian
an-	anarchist
ana-	anatomy
ant-	antagonize
ante-	antedate
anti-	antitoxin
ap-	appeal
apo-	apostasy
ar-	arrive
arch-	archbishop
archi-	architect
as-	assign
at-	attain
auto-	automobile
be-	beguile, because
bene-	benefactor
bi-	bicycle
bio-	biography
by-	bystander
cata-	catalog
cath-	catholic
circum-	circumference
cis-	cisatlantic
co-	cooperate
col-	collateral
com-	commemorate
con-	connection
contra-	contradict
cor-	correlation
counter-	counteract
de-	deduce
di-	dilemma
dia-	diagnose
dif-	different
dis-	dismiss
dys-	dysentery
e-	eliminate
ec-	eccentric
ef-	effect
em-	embargo, emperor
en-	enchant
enter-	entertain
eph-	ephemeral
epi-	epigram
equi-	equidistant
es-	escort
eu-	eulogy
ex-	exaggerate
extra-	extraordinary
for-	forget
fore-	forecast
hemi-	hemisphere
hetero-	heterogeneous
homo-	homonym
hyper-	hyperbole
hypo-	hypotenuse
i-	ignorant
il-	illiterate
in-	inactive, into
infra-	infrared
inter-	intersection
intra-	intramural
intro-	introduce
ir-	irritable
mal-	maltreat
mega-	megaphone
meta-	metamorphosis
mis-	mistake
mono-	monograph
multi-	multiform
neo-	neolithic
non-	nonchalant
ob-	obstacle
oc-	occur
of-	office, offer
off-	offset
omni-	omnipotent
on-	onslaught
op-	oppose
ortho-	orthodox
out-	outline, outlive
over-	overcome
pan-	panacea
panto-	pantomime
para-	paraphrase
pen-	penultimate
per-	percolate

peri-	periphery	super-	superhuman
poly-	polysyllable	sur-	surrender
por-	portrait	sus-	suspender
post-	postscript	syl-	syllogism
pre-	precede	sym-	symbol
pro-	proceed	syn-	syntax
pseudo-	pseudonym	tele-	telephone
pur-	purpose	thorough-	thoroughfare
re-	revise	tra-	tradition
red-	redeem	tran-	transcendental
retro-	retrospect	trans-	transatlantic
se-	secession	tres-	trespass
semi-	semicircle	tri-	triangle
sub-	subsoil	ultra-	ultraviolet
subter-	subterfuge	un-	unlock, until
suc-	succeed	under-	understand
suf-	suffer, suffice	uni-	university
sug-	suggest	up-	upset
sum-	summons	vice-	vicepresident
sup-	suppose	with-	withdraw, without

LIST OF SUFFIXES AND FOREIGN ENDINGS, WITH EXAMPLES:
(Combinations of two affixes are marked 2)

-a	area, idea, opera, data	-ate	activate
-able	suitable	-ation	operation
-aceous (2)	rosaceous	-cide	homicide
-acious (2)	vivacious	-cle	cubicle
-acy (2)	fallacy	-cracy (2)	democracy
-ade	lemonade	-crat	aristocrat
-age	marriage	-cy	bankruptcy
-ae	alumnae	-dom	freedom
-ain	certain, captain	-ee	employee
-al	cereal, real	-eer	pioneer
-an	American	eign	foreign, sovereign
-ana	Lincolniana	-el	hotel, shovel
-ance	abundance	-en	fasten, golden (not: happen)
-ancy (2)	pregnancy		
-ant	hesitant	-ence	inference
-ar	liar	-ency (2)	tendency
-ard	drunkard	-ent	competent
-arian (2)	librarian	er	teacher, folder
-arium (2)	aquarium	ern	northern
-art	braggart	-ery	pottery
-ary	commentary	-es	series, mores

esce	coalesce
-escent (2)	adolescent
-ese	Chinese
-esque	Romanesque
-ess	princess
-et	pocket, violet
-ete	obsolete
-etic	energetic
-ette	cigarette
-ey	alley, money
-ferous (2)	vociferous
-fic	specific
-fication (2)	amplification
-fold	manifold
-form	uniform
-ful	beautiful
-fy	testify
-gram	monogram
-graph	phonograph
-graphy (2)	photography
-hood	childhood
-i	stimuli
-ial	facial
-ian	Bostonian
-ible	edible
-ic	basic
-ical (2)	logical
-ice	service
-ics	antics
-id	stupid
-ide	bromide
-ie	movie
-ier	soldier, financier
-ies	species
-il	civil
-ile	fragile
-im	victim, interim
-in	insulin
-ine	gasoline
-ion	division
-ique	technique
-is	crisis
-ise	treatise, merchandise
-ish	finish, English
-isk	asterisk
-ism	Fascism
-ist	egoist
-it	limit, unit
-ite	polite, unite
-ition	nutrition
-itis	arthritis
-ity	authority
-ium	solarium
-ive	creative
-ize	criticize
-kin	manikin
-le	twinkle, battle (not: little)
-less	endless
-let	booklet
-like	childlike
-ling	duckling
-logy (2)	criminology
-ly	cleanly, daily
-m	poem, phlegm
-ma	stigma, coma
-me	scheme, theme
-meal	piecemeal
-men	specimen
-ment	achievement
-meter	hexameter
-mony (2)	alimony
-most	topmost
-nd	errand, reverend
-nda	agenda, propaganda
-ness	greatness
-nomy (2)	economy
-o	ratio
-ock	hillock
-od	method, period
-oid	celluloid
-ol	phenol
-on	criterion
-one	ozone
-oon	balloon, cartoon
-or	doctor, sailor
-ory	factory
-orium (2)	auditorium
-os	chaos
-ose	verbose

-osis (2)	apotheosis	-ue	value, issue
-ous	famous	-um	forum
-phile	Anglophile	-ure	nature, future
-ry	dentistry	-us	nucleus
-scope	microscope	-ute	minute, statute
-ship	dictatorship	-verse	universe
-some	handsome	-vert	extrovert
-son	reason, prison	-ward(s)	afterward
-sophy (2)	philosophy	-ways	always
-ster	gangster	-wise	likewise
-stress	seamstress	-worthy (2)	praiseworthy
-th	warmth, wealth, faith	-x	apex, vertex
-t	draft, height	-y *	very, breezy, army, beauty, party, city, dolly
-tion	portion		
-tude	multitude		

* Count –y also when it appears as –i–; e.g., ladies, heavier, business, hurried.
* Do not count –y in any, body, every, many.

These lists of prefixes and suffixes are not exclusive. They do not contain rare affixes, like -aign in "campaign." On the other hand, do not count mechanically everything that looks like an affix but is part of the root, like -er in "matter." If in doubt, follow the etymological explanation of a good dictionary. Every affix that fits the above definition should be counted. If a word consists only of two or more of the listed affixes, one is to be considered the root, e.g., -soph- in "philosophy" or -meter in "diameter."

NOTE: Do not count affixes in proper names, like "Fanny Farmer" or "Argentine," unless the original meaning is preserved, as in "United States." One word may have several affixes, e.g., "compartmentalization" (5), "undeservedly" (4), "disenfranchisement" (4).

5. *Counting the number of personal references (the "human interest factor," X_H).*

Count all personal references in your hundred-word sample. If your text has more or less than a hundred words, compute the number of personal references per hundred words. Dis-

regard capitalizations. Personal references are: names, personal pronouns, and certain words listed below.

NAMES:

Count all names of people or animals (first names, last names, nicknames, petnames, etc.). Count the full name with titles as one personal reference, e.g., "the Vice-President, Mr. Henry Agard Wallace."

PERSONAL PRONOUNS:

I, thou, you, he, she, we, they; me, thee, him, her, us, them; my, mine, thy, thine, your, yours, his, her, hers, our, ours, their, theirs; myself, thyself, yourself, himself, herself, ourselves, yourselves, themselves.

NOTE: they, them, their, theirs, themselves, are to be counted only if they refer to people, or to animals which appear as characters in the passage or story. Count she, her, etc., even if referring to a ship or a country.

WORDS INDICATING HUMAN BEINGS OR RELATIONSHIPS:

Aunt, baby, boy, brother, child, cousin, dad, daddy, dame, daughter, family, father, fellow, folks, friend, gentleman, girl, guy, husband, kid, lad, lady, lass, madam(e), mamma, man, miss, mister, mother, nephew, niece, pal, papa, parent, people, (not peoples), sir, sister, son, sweetheart, uncle, wife, woman; and combinations of these words with each other and with grand-, greatgrand-, step- and in-law. Count also familiar forms of these words, like "grandpa."

This list is exclusive. Do not count any other words, like "teacher" or "doctor."

EXAMPLE: "My Aunt Mary herself" contains four personal references.

6. *Averaging results.*

Compute the average of each statistical measure from all your samples.

7. *Formula.*

Insert the values for X_S, X_M and X_H in the following formula:

$$.1338\ X_S + .0645\ X_M - .0659\ X_H + 4.2498.$$

The end result gives the reading grade placement.

Placement in Class I to Class VII can be achieved directly by subtracting 5.0 from the reading grade placement by the formula, or by using the alternative formula:

$$.1338\ X_S + .0645\ X_M - .0659\ X_H - .7502.$$

In this notation, 0.0 indicates material for adult readers who are barely literate, and 7.0 corresponds to reading matter that requires considerable effort even from highly educated adults.

8. *Conversion table (to be used for adult readers).*

Class	*Reading grade placement by formula*	*Description*	*Typical magazine*	*Reading grade placement (estimated correction)*
I	5.9 and below	Very easy	(none)	5.9 and below
II	6.0 to 6.9	Easy	*True Story*	6.0 to 6.9
III	7.0 to 7.9	Fairly easy	*Liberty*	7.0 to 7.9
IV	8.0 to 8.9	Average difficulty	*Reader's Digest*	8.0 to 9.9
V	9.0 to 9.9	Fairly difficult	*Harper's Magazine*	10.0 to 12.9
VI	10.0 to 10.9	Difficult	*Yale Review*	13.0 to 16.9 (college)
VII	11.0 and above	Very difficult	*Scientific Monthly*	17.0 and above (college graduate)

Appendix B

SAMPLE PASSAGES OF GRADED READABILITY

I. READING GRADE PLACEMENT 5.6

"One day a little Chinese boy of eight, named Wenkung, was playing with his brother Venyao in a garden. Suddenly, Venyao fell into a big vessel full of water. Wenkung tried to pull his brother out, but found that he was neither tall enough nor strong enough. Soon he picked up a stone and broke the vessel. The water flowed out and his brother was saved. Wenkung later became a great man."

73 words
average sentence: 12 words
18 affixes in 100 words
21 personal references in 100 words

Standard Test Lessons in Reading
Book Three, Test Lesson 17

II. READING GRADE PLACEMENT 6.3

"I was in the store when Russ came in, and the first time our eyes met I felt lost. I had never met a man like him before. He was bluff and hearty, brimming over with good humor. He was good looking, with black hair and dark eyes. When he smiled you felt the force of his personality, and he smiled often in those days.

"I guess he felt the same way I did, because he lost no time in asking me for a date.

"It wasn't long before we knew we were in love, but it was two years before we married."

103 words
average sentence: 15 words
21 affixes in 100 words
20 personal references in 100 words

True Story
August 1941, p. 104

III. READING GRADE PLACEMENT 7.2

"There was a terrace with tables that looked down upon the blue water and up at the blue sky. Bill spoke to the headwaiter and the man led them to a corner with a very special view. Above them a breeze moved in the branches of the age-old trees. Presently a million stars popped out to prick the indigo dome with points of silver fire. All about were couples with their heads close together across tables built for two.

"It was a perfect set-up for romance."

86 words
average sentence: 14 words
23 affixes in 100 words
6 personal references in 100 words

Liberty
July 4, 1942, p. 16

IV. READING GRADE PLACEMENT 8.3

"All right, then, it's agreed that, despite all we've read about diet and vitamins, many of us still don't have the right foods; if we did many of us could literally eat our way to better health.

"But what, specifically, should we eat? Isn't that a question which is clear only to nutritional specialists who make out complicated and confusing dietary lists?

"No. For normal living the answer is simple. It's as simple as being sure to eat grapefruit, oranges or tomatoes, with their C vitamins, every day; it's as simple as drinking milk daily. (Milk, cheese, butter, eggs are teeming with vital food elements, infinitely more valuable than the starches, sugar and fats which we overeat.)"

117 words
average sentence: 17 words
34 affixes in 100 words
6 personal references in 100 words

Reader's Digest
April 1942, p. 38–39

V. READING GRADE PLACEMENT 9.3

"For most of us who have rowed in an eight-oared shell there is no hope whatever of continuing after we have left college,

but the love of it remains. A few weeks ago I met a Yale man who had rowed there while I was at Harvard. I don't remember how the subject came up, but we began talking about it, then we drew away from the rest of the party and lovingly, happily rowed over our whiskeys until our wives dragged us home. This has happened to me many times. No writer has told the nature of rowing in an eight-oared shell to landsmen; none who haven't rowed understand what it is we remember—the crash of the oars in the locks, the shell leaping at the catch, the unity and rhythm and the desperate effort; so that now when we meet we babble with joy."

147 words
average sentence: 29 words
29 affixes in 100 words
11 personal references in 100 words

Harper's Magazine
July 1942, p. 174

VI. READING GRADE PLACEMENT 10.2

"Up to a point you can describe things consecutively, but beyond that there is no sequence of events. The things that happen have their reality only in the manner in which they exist in or momentarily impinge on the mind of the person caught up in their midst. The mind of that person does not see consecutively; it is impressed by a series of images which in themselves have no logical connection but exist only as isolated, unrelated phenomena. The mind, in art and in life, feels a basic need for some kind of arrangement of these unrelated phenomena. Suddenly deprived of this, it finds itself facing a horror and a loss that is far deeper than any more physical distress of the moment. There is a kind of eerie surrealist dream quality about it."

135 words
average sentence: 22 words
47 affixes in 100 words
1 personal reference in 100 words

The Yale Review
March 1939, pp. 525–6

VII. READING GRADE PLACEMENT 12.3

"Anthropologists have long recognized that the spread of customs from one group of people to another—'diffusion' in anthropological terminology—accounts for at least nine tenths of the culture of any group. On its face, this would seem to assign any kind of economic determinism an insignificant role. An analysis of this problem, however, in the light of what is known of culture change among primitive peoples, both before and after they have experienced acculturation resulting from contact with European cultures, exposes its considerable complexity. Under certain conditions, subsistence patterns—that is the activities concerned with acquiring food, clothing, shelter and other things indispensable to existence—have imposed very narrow limits on possible variations of social and economic organization. Under other conditions, it is evident that considerable latitude is possible in the socio-economic structure."

134 words
average sentence: 27 words
70 affixes in 100 words
1 personal reference in 100 words

The Scientific Monthly
December 1941, p. 491

Appendix C

AN EXAMPLE OF SIMPLIFICATION

PASSAGE VII OF APPENDIX B

(SIMPLIFIED TO READING GRADE PLACEMENT 6.7)

"At least nine tenths of the culture of any group of people goes back to customs spread from another group. Scientists have known this for a long time. So it seems there is not much to the theory that our habits and ideas are shaped by the way we make our living. But it is not as simple as that. We know a lot about how primitive people change their customs. We know how they do that before they get in touch with European ways, and we know how they do it afterwards. In some cases there is very little they can change in the way they live and work together. It is all tied up with what they have to do to get food, clothing, shelter and whatever else they need. Under other conditions, we can see that the people have much leeway in the setup of their group life and work."

153 words
average sentence: 17 words
15 affixes in 100 words
12 personal references in 100 words

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